



DoD Installations, Energy and the Environment: An Update

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Installations & Environment***

E²S² Symposium

May 10, 2011



Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE 10 MAY 2011		2. REPORT TYPE		3. DATES COVERED 00-00-2011 to 00-00-2011	
4. TITLE AND SUBTITLE DoD Installations, Energy and the Environment: An Update				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Office of the Deputy Under Secretary of Defense (Installations & Environment), 3400 Defense Pentagon, Room 3B856A, Washington, DC, 20301-3400				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES Presented at the NDIA Environment, Energy Security & Sustainability (E2S2) Symposium & Exhibition held 9-12 May 2011 in New Orleans, LA.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 37	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



I. Why Facilities Energy Matters

II. Facilities Energy Core Strategy

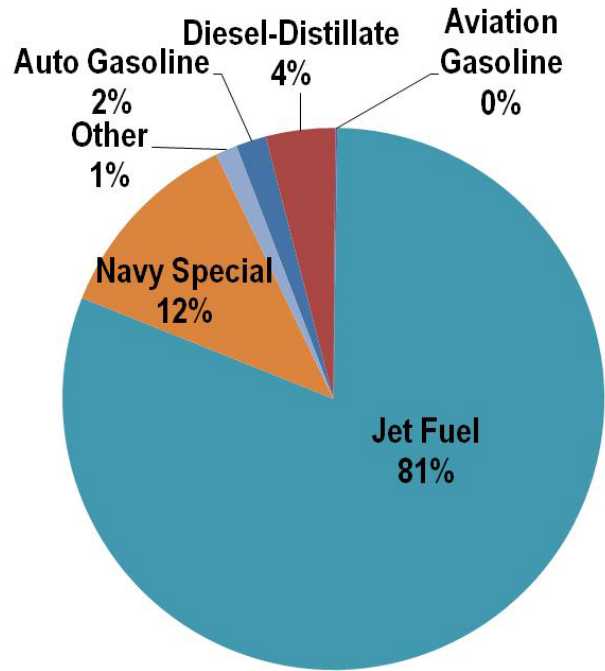
III. Key Role of Technological Innovation

IV. Other I&E Priorities



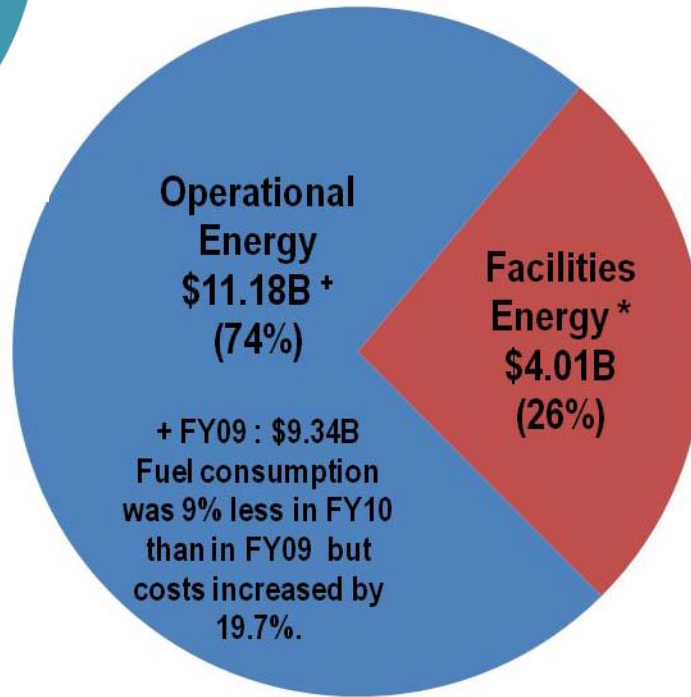
DoD Energy Costs, FY2010

Acquisition, Technology and Logistics

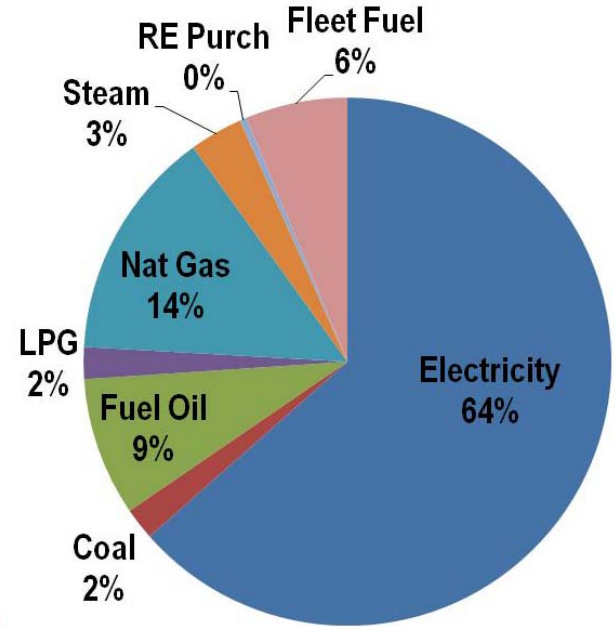


Operational

DoD Energy Costs
FY10: \$15.2B
FY09: \$13.4B



+ FY09 : \$9.34B
Fuel consumption was 9% less in FY10 than in FY09 but costs increased by 19.7%.



Installations

* \$4.01B in facilities energy costs include non-tactical vehicle fuel \$3.76B – facilities energy \$0.25B – non-tactical vehicle fuel

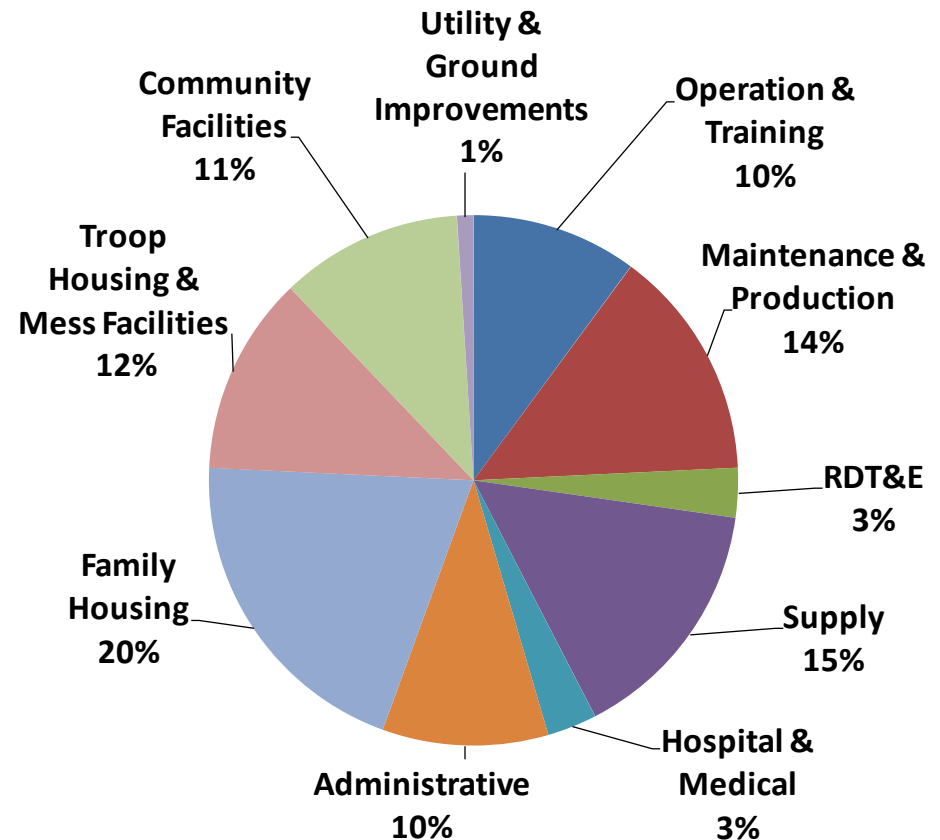


DoD Built Infrastructure

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- **539,000 Facilities**
(buildings and structures)
 - 307,295 buildings
 - 2.2 billion square feet
- **Comparisons**
 - GSA: 1,500 government buildings
 - 176 million square feet
 - Wal-Mart US: 4,200 buildings
 - 687 million square feet
- **160,000 Fleet Vehicles**

DoD Building Stock





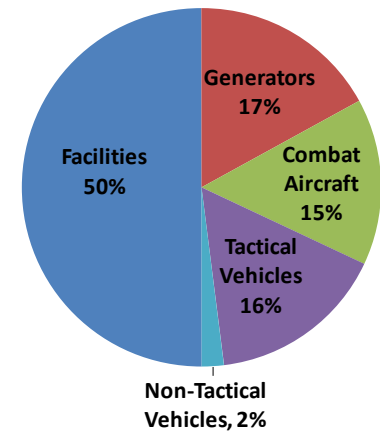
Why Facilities Energy Matters

Acquisition, Technology and Logistics

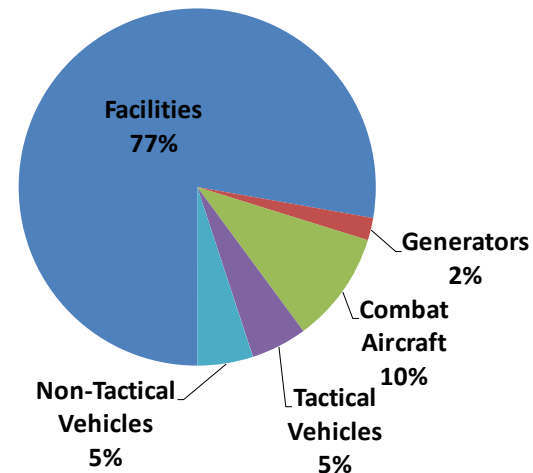
- Significant Cost
 - FY10: \$4.0 billion (26% of total DoD energy costs)
 - Cost likely to increase (reduced presence in Iraq and Afghanistan, improved QoL)
- Environmental Impact
 - Contributes a disproportion share (~ 40%) of GHGs
- Mission Assurance/Energy Security
 - DoD's reliance on a fragile commercial electricity grid places continuity of critical missions at serious and growing risk ¹

¹ Defense Science Board, "More Fight – Less Fuel," February 2008

Army CO₂ Emissions Today



Army CO₂ Emissions Future?

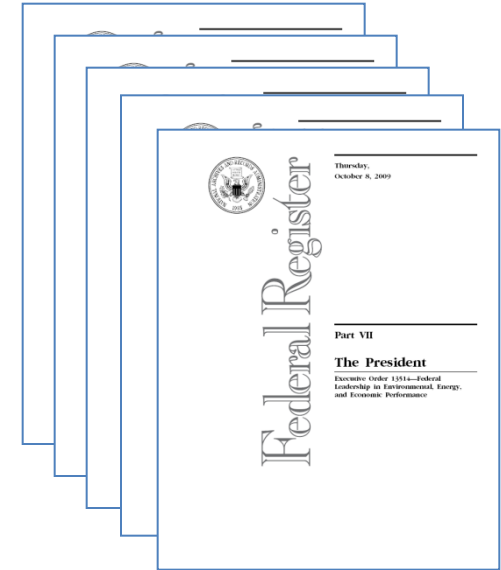




Key Energy Goals

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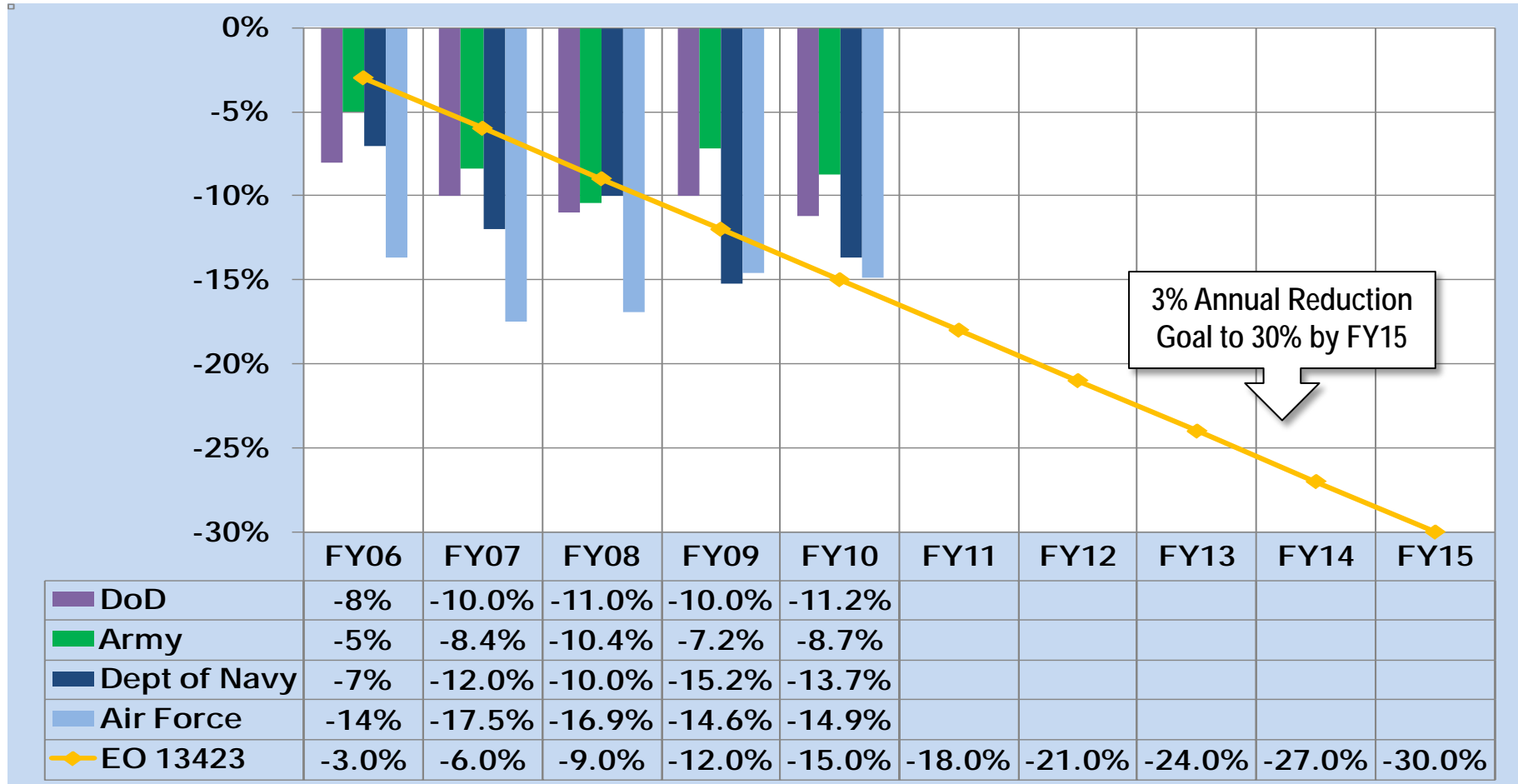
- Legislation and Executive Orders
 - EPLA 2005, EISA 2007, NDAA
 - EO 13423, EO 13514
- Key Targets
 - Facility Energy Efficiency
 - Reduce facilities energy intensity by 30% by 2015 and 37.5% by 2020 (2003 baseline)
 - Renewable Energy
 - Consume 7.5% of electric energy from renewable resources by 2013
 - Produce or procure 25% of facilities energy from renewable sources by 2025
 - Water
 - Reduce potable water intensity by 26% from a 2007 baseline by 2020.
 - Reduce non-potable water consumption by 20% by 2020 from a 2010 baseline





DoD Progress Towards EISA2007 Sec. 431 Facilities Energy Intensity Reduction Goal

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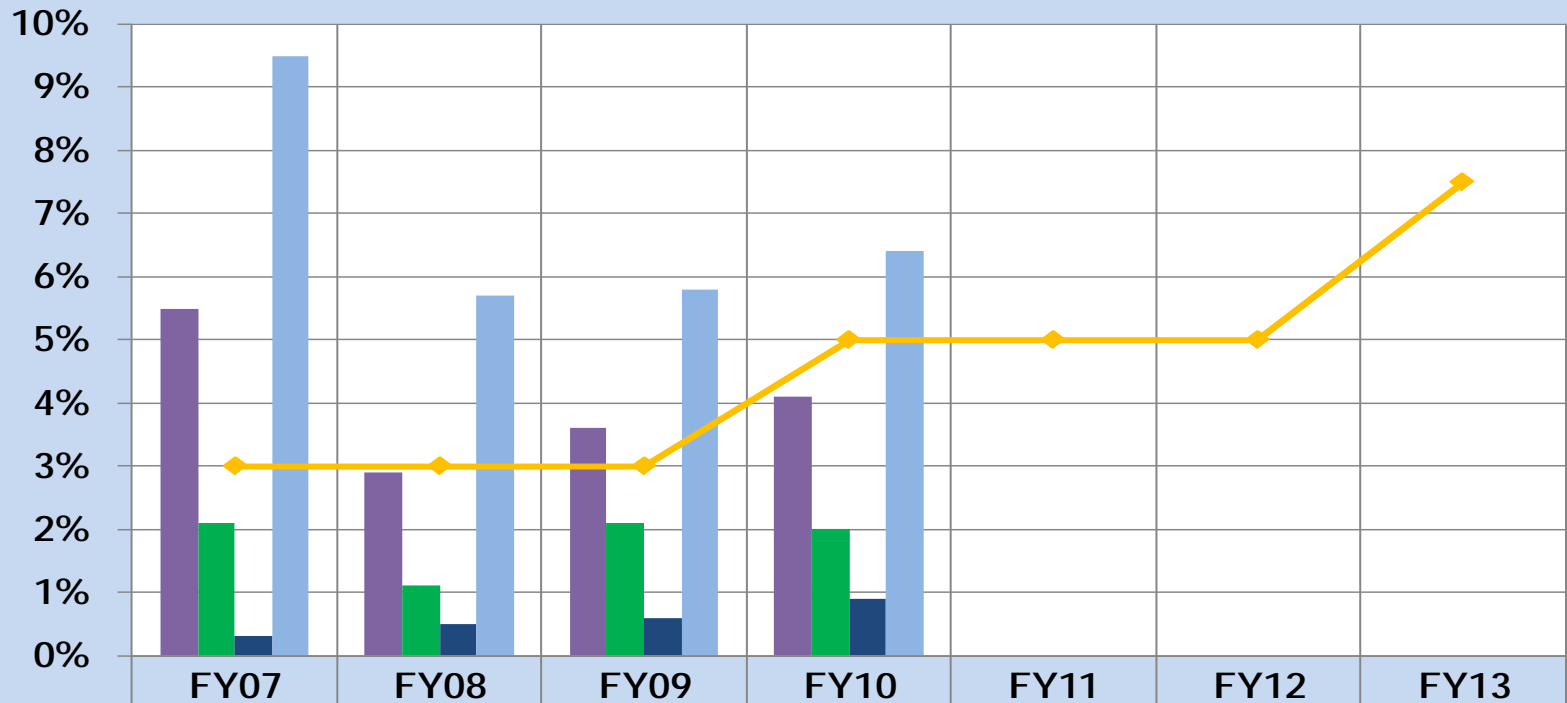


Reduce facilities energy intensity by 30% by 2015 and
37.5% by 2020 (2003 baseline).



DoD Progress Towards EPL 2005 Sec 203 Renewable Energy Goal

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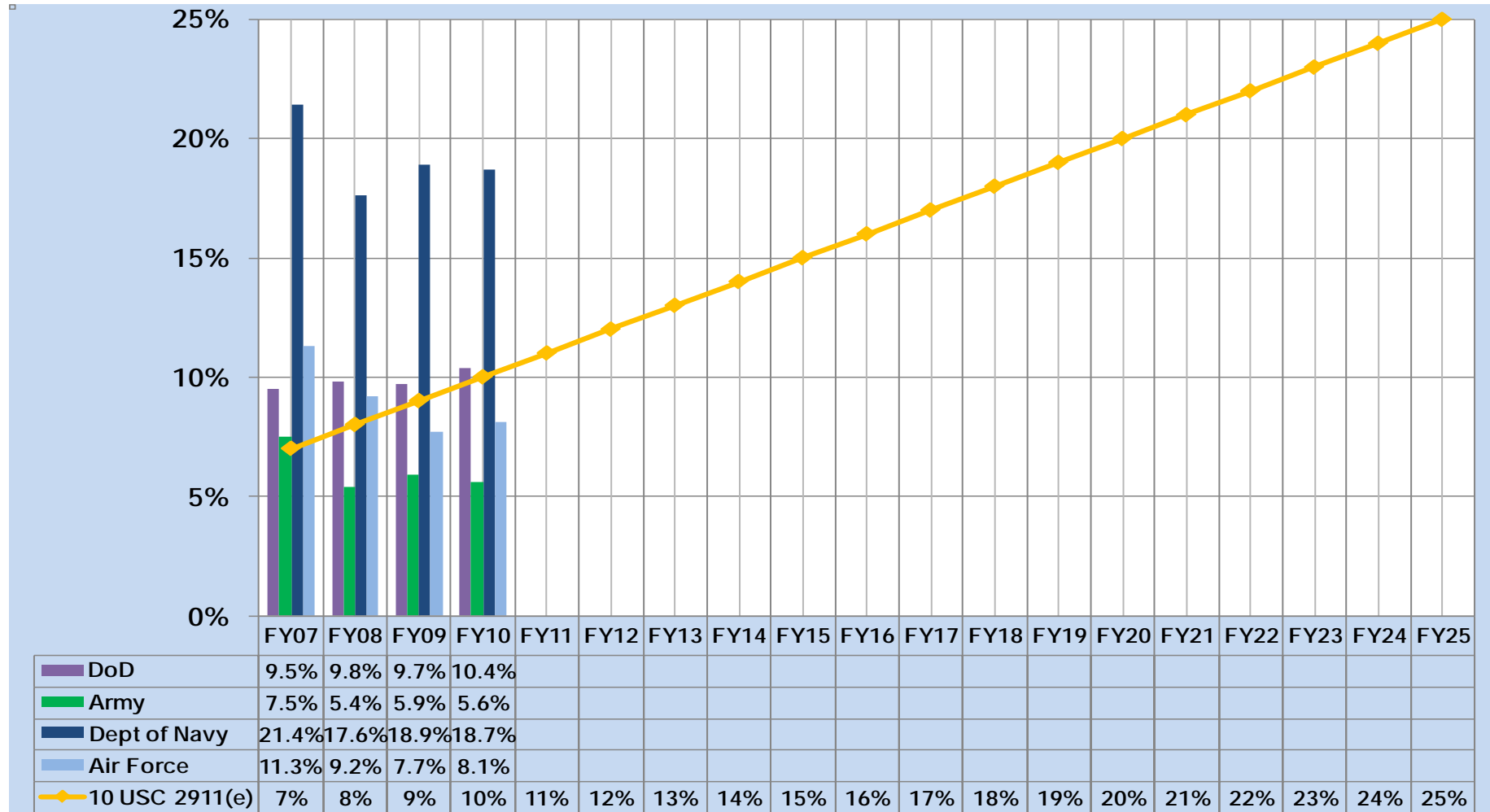


Consume 7.5% of electric energy from renewable resources by 2013.



DoD Progress Towards 10 USC 2911(e) Renewable Energy Goal

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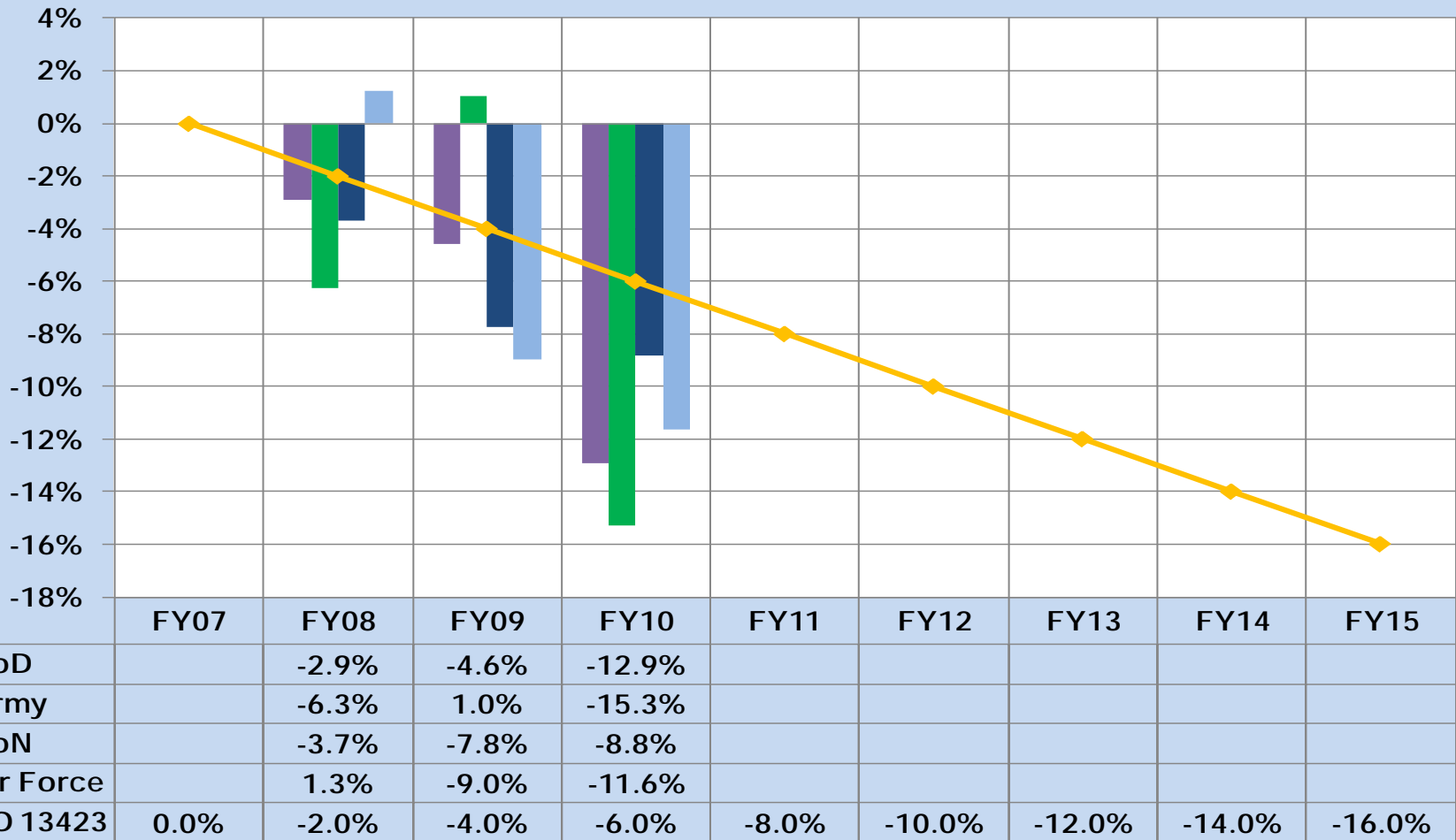
Produce or procure 25% of electricity consumed from
renewable sources by 2025.



DoD Progress Towards EO 13423

Water Intensity Goal

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Reduce potable water intensity by 26% from a 2007 baseline by 2020.



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III. Key Role of Technological Innovation

IV. Other I&E Priorities



Facilities Energy Core Strategy

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- **Reduce Demand** – energy efficiency/conservation
 - Use SRM budget (\$8.8B) to retrofit existing buildings
 - Use MilCon budget (\$14.8B) to improve new construction
 - LEED Silver (40% of points from energy and water)
 - 30% above ASHRAE standards
 - Private financing (ESPCs) also key
- **Increase Supply** of renewable/alternative energy
 - Large military installations well suited to support solar, wind and geothermal, but T&E species a challenge
 - Potential for rooftop renewable on large scale
 - Private financing essential
- **Improve Energy Security** – focus on grid disruption
 - Risk mitigation plans
 - Micro-grid demonstrations
 - Net Zero Energy Installation initiatives





Facilities Energy Program Review

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- **Facilities energy budget not well defined**
 - MilCon and FSRM represent the majority of expenditures that reduce facility energy consumption, but energy specific investments not separated.
 - ECIP: Only dedicated funding line for energy investments, <10% of total investments required to meet mandates.
- **FY12 POM Review**
 - Attempted to identify non-ECIP energy investments funded by MilCon and FSRM
 - Determined need for a facilities energy budget exhibit to identify requirements and program shortfalls to meet energy targets
- **I&E working Comptroller and CAPE to develop budget exhibit**
 - Add to Financial Management Regulation requirement for Services to submit facilities energy budget exhibit with Pres Bud
 - Budget exhibit will identify requirements to meet energy mandates and how much Services are programming across the FYDP



Energy Conservation Investment Program

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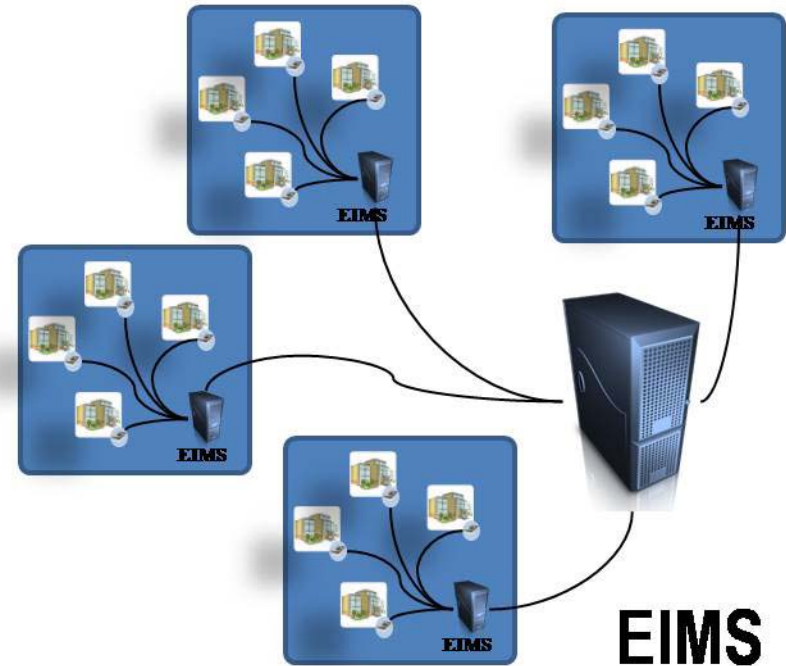
- Small but key component of the Department's strategy. ECIP projects historically obtained better than two dollars in life-cycle savings for every dollar invested.
- Funding: FY09--\$210M, FY10--\$174M, FY11--\$120M (?), FY12--\$135M request
- Project selection: Beginning in FY12, ECIP will move away from routine energy efficiency and renewable projects, which can be accomplished with O&M funds, to projects that will produce "game changing" energy efficiency improvements:
 - Integrate distributed generation & storage to improve supply resiliency for critical loads
 - Implement energy security plans, especially at those installations where such investments leverage partnerships with the Department of Energy
 - Dramatically change the energy consumption at individual installations (e.g power and steam plant level investment)
 - Integrate multiple energy savings, monitoring, and renewable energy technologies to demonstrate synergistic benefits
 - Implement technologies validated in DoD's Installation Energy Test Bed Initiative or other DoD/DoE sponsored demonstration programs



Enterprise Energy Information Management

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- DoD Enterprise Energy Information Management System
 - New OSD initiative to provide an enterprise-wide capability to effectively monitor, measure, manage and maintain energy systems at optimal performance level
 - Will enable more informed facilities energy investment and management decisions



OSD Energy Management System Concept
Utility Consumption
(Elec/Water/Gas/Oil)
Utility Purchasing
Consumption and costs aggregated by supply,
usage, customer, facility, installation,
Command, Component, conditions
Reporting/Dashboard



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Technology Development Process

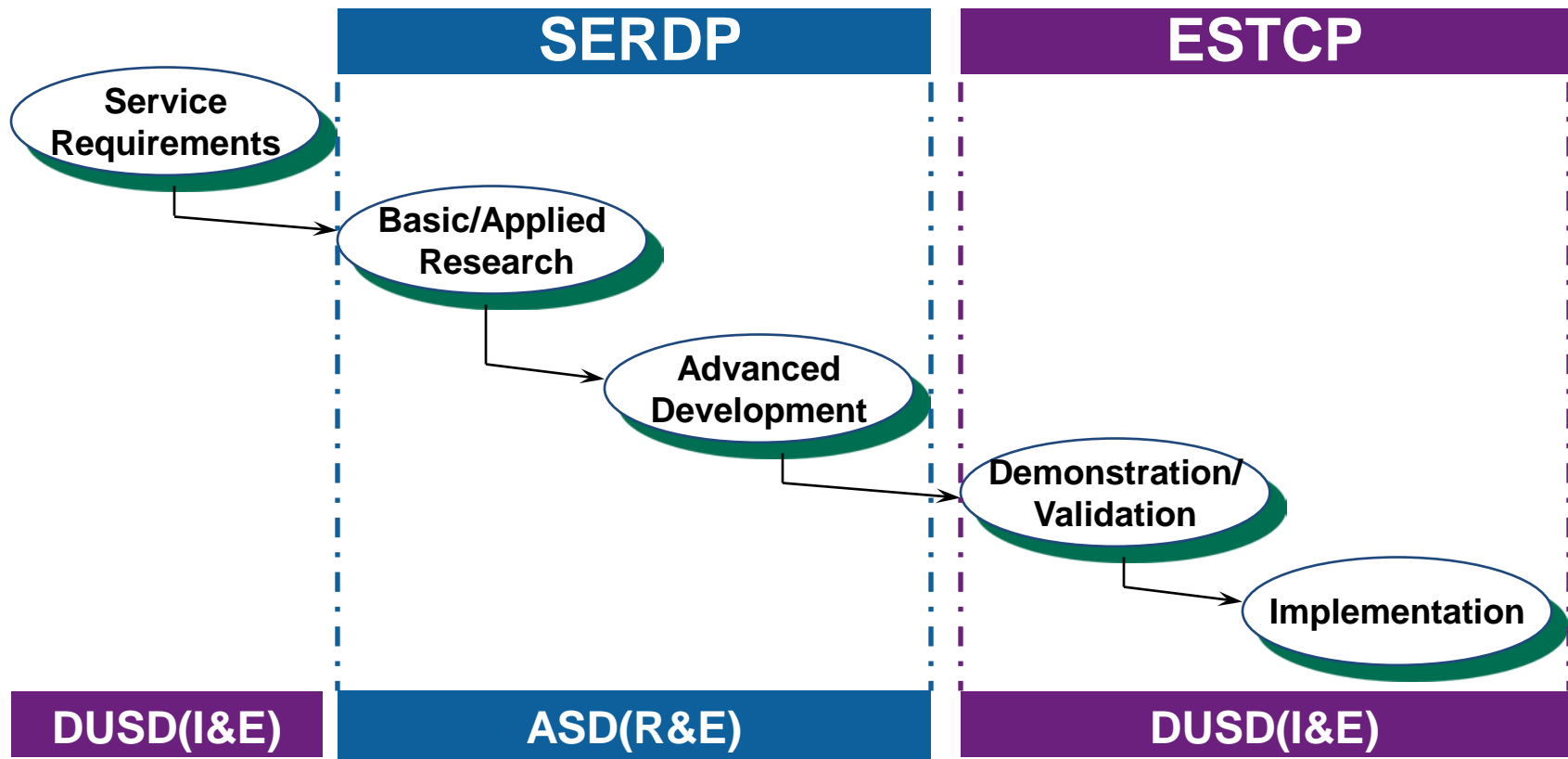
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Science and Technology



Demonstration/Validation



A Requirements Driven Integrated Program



ESTCP Focus Areas

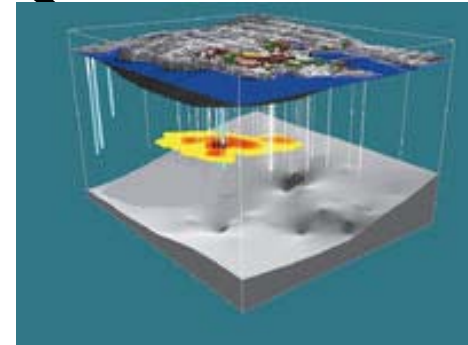
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Weapons Systems & Platforms



Energy & Water

Environmental Restoration



Resource Conservation & Climate Change



Munitions Response



ESTCP Installation Energy Test Bed

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- Emerging technologies hold the promise of dramatic improvements in building energy performance but face major impediments to commercialization and deployment
 - A&E firms face liabilities but do not share in savings
 - Disincentives for ESCOs
 - No incentive for first use
 - Highly cost-sensitive market
 - Lack of operational testing deters potential adopters
- DoD's Test Bed Initiative is designed to overcome these barriers
- DoD is uniquely positioned to play this role
 - It is in DoD's self interest given the size of our inventory (Wal-Mart has its own energy test bed but it is limited to big-box stores)
 - DoD's built infrastructure is unique for its size and variety— it captures the diversity of building types and climates in U.S.
 - Military has 150 years of experience as a sophisticated first user of new technology and an early, market-creating customer (jet engines, aircraft, integrated circuits, GPS, internet)



FY 2012 Solicitation

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Installation Energy Solicitation Released on February 1, 2011

- 1. Smart Micro-grids and Energy Storage to Increase Energy Security on DoD Installations**
- 2. Renewable Energy Generation on DoD Installations**
- 3. Advanced Component Technologies to Improve Building Energy Efficiency**
- 4. Advanced Building Energy Management and Control**
- 5. Tools and Processes for Design, Assessment and Decision-making Associated with Energy Use and Management**



Installation Energy Test Bed Project Locations

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49 Energy Projects

- 2007 = 1
- 2008 = 6
- 2009 = 9
- 2010 = 10 (2 SERDP)
- 2011 = 23
- 49 Total**



Note: Eight demonstration projects occur at multiple locations.



BIPV Roofs

DESCRIPTION

- Validate whether BIPV roofs can endure weather conditions as well as conventional roofs
 - Luke AFB, MCAS Yuma, NAS Patuxent
- Verify whether a roof integrated solar photovoltaic system can perform as a cost effective energy efficient roof
- Promote adoption of BIPV roof technology within DoD through the Unified Facilities Guide Specification (UFGS)



BENEFITS/METRICS

- Demonstrations will document energy savings, costs, reliability and applicability to DoD roofs
- Effectively low cost per Watt installed

PERFORMERS

- NAVFAC ESC
- Lawrence Berkeley National Laboratory
- ERDC- CERL
- SEI Group, Inc



Continuous Building Commissioning

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DESCRIPTION

Objectives are to demonstrate whole-building modeling and monitoring systems capable of:

- 1) identifying, classifying, and quantifying energy and water consumption deviations from design intent or optimal,
- 2) identifying the causes of those deviations, and
- 3) recommending, prioritizing, and implementing corrective actions

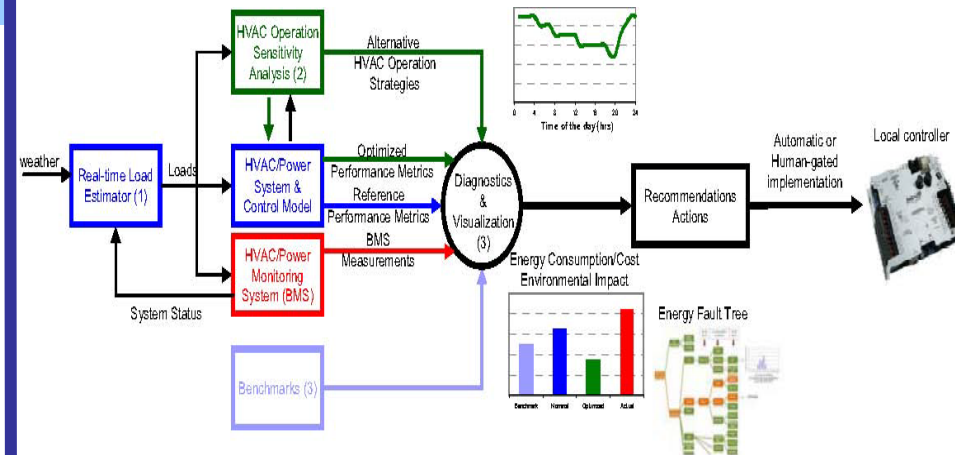


Figure 1. Block diagram of the proposed Advanced Building Energy Management Systems

BENEFITS/METRICS

- Demonstrations will document energy savings, costs, reliability and applicability to DoD buildings.
- Successful implementation of this technology will enable reduced energy consumption, peak electric demand, and water use in DoD buildings by providing actionable information to facility managers and building operators.

PERFORMERS

- United Technologies Research Center
 - Lawrence Berkeley National Laboratory
 - University of California, Berkeley
- Multiple Projects
 - Model based performance of single buildings
 - Scalability through reduced order models
 - Campus scale

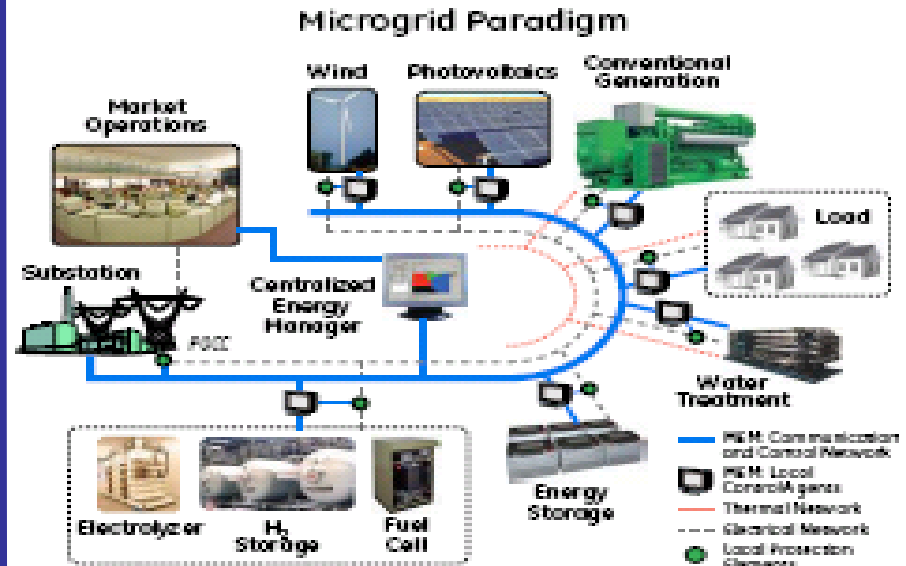


Smart Microgrids

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DESCRIPTION

- Enhance and demonstrate an advanced micro grid technology for DoD installations
 - Microgrid design
 - Optimal dispatch
 - Load shedding
 - Intentional islanding
 - Energy management
- Demonstrations at 29 Palms and Ft. Bliss



BENEFITS/METRICS

- Allow secure islanding of DoD installation and reduce costs of electricity
- Increase use renewables, energy efficiency and improve power quality

PERFORMERS

- GE Global Research
 - 29 Palms
- Lockheed Martin
 - Ft. Bliss
- FY 2012 BAA
 - TBD



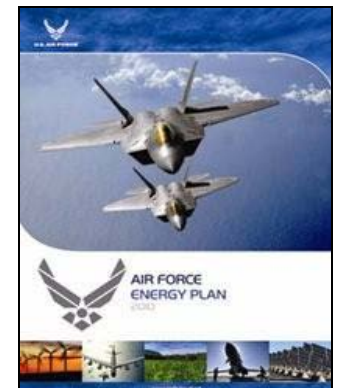
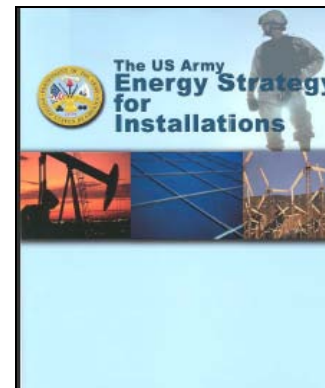
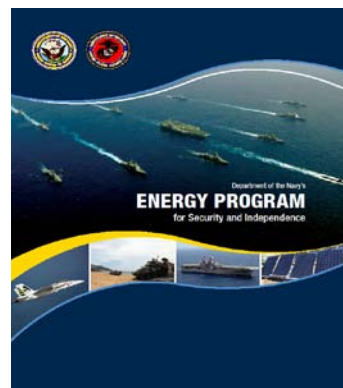
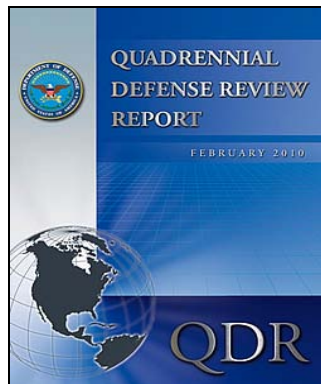
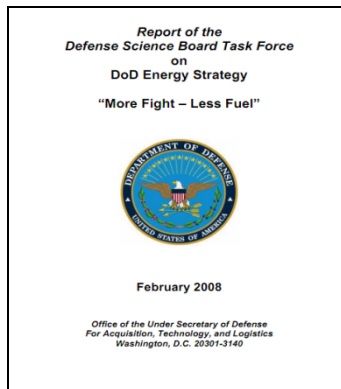
DOE-DOD Energy Security MOU

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"Concerning Cooperation in a Strategic Partnership to Enhance Energy Security"

The Purpose:

- Identify a framework for cooperation and partnership between the Department of Energy (DOE) and the Department of Defense (DOD)
- Strengthen coordination of efforts to enhance national energy security, and demonstrate Federal Government leadership in transitioning America to a low carbon economy





DOE-DOD Executive Leadership

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Executive Committee Co-Chairs

- Patricia Hoffman, Office of Electricity Delivery and Energy Reliability, DOE
- Sharon Burke, Assistant Secretary, Operational Energy, DOD
- Dorothy Robyn, Deputy Under Secretary, Installations and Environment

DOE

- Electricity Delivery and Energy Reliability (OE)
- Office of the Deputy Secretary
- Energy Efficiency and Renewable Energy (EERE)
- Advanced Research Project Agency-Energy (ARPA-E)
- Nuclear Energy (NE)
- Fossil Energy (FE)
- Office of Science (SC)

DOD

- Operational Energy Plans and Programs
- Installations and Environment (I&E)
- Army
- Navy
- Air Force
- Research and Engineering (DDR&E)
- Joint Staff (J4)



Advisory Group Priority Areas

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- **Mobility and Strike Capability**
 - Vehicles
 - Biofuels
 - Storage
- **Energy Reliability and Efficiency on DOD Bases**
 - Smart grids/Microgrids/Power Management
 - Storage
 - Soldier Systems
 - Small Modular Reactors
 - Siting Renewables
 - Building Efficiency
 - Energy Parks/Asset Revitalization
- **Institutional Cooperation**
 - COCOM Energy Advisors
 - Professional Military Education
 - DOE-DOD MOU Catalog



Efficiency and Reliability: Grid Storage at DOD Installations

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Voltage Ride-through

Stability During Pulsed Power
Requirements for Radar, etc.

Continuity of Operations

Short-term and Long-Term Blackout
Contingency Capacity

Black-Start Capability

Post-Blackout Restart Capability

Energy Savings

Reduced Fuel Costs, Reduced Demand
Charges/Energy Charges

- **Goal:** Develop Profile of Capacity / Duration / Reliability and Cost for Energy Storage at DoD CONUS facilities
- **Target:** Approximately Five DoD Relevant Uses of Energy Storage
- **Outcome:** Address 'Serial #1' Problem for Adoption of New Storage Technologies on Grid
- **Team:** Leverage EPRI's expertise of grid storage applications, ARPA-E's technology knowledge, and ESTCP's understanding of facilities





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Renewable Energy Siting Challenges

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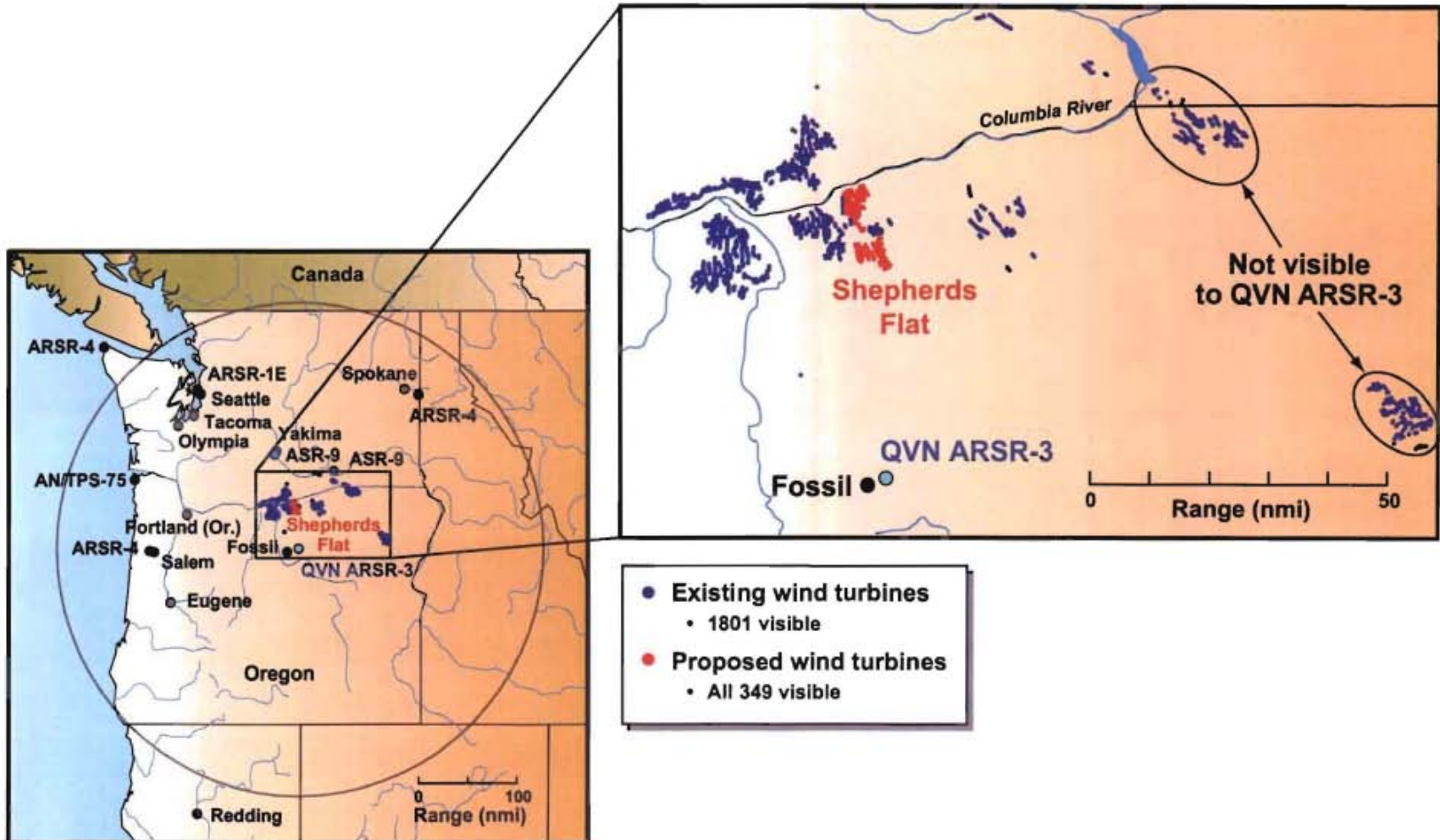
- Turbines and solar towers can interfere with military radar and flights
- Problem arises in 3 contexts
 - Surveillance
 - Weapon system testing
 - Operations & training
- DoD weighs in late in process because of nature of the FAA review process





Shepherd's Flat – We Were Unprepared

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Renewable Energy Siting – Way Forward

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- Energy Siting Clearinghouse
- R&D to better model impact and mitigate potential adverse effects
- Accelerate upgrades to and replacement of surveillance radars





DoD Energy Siting Clearinghouse

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- A Single DoD Voice
 - Timely, repeatable, and predictable process that promotes compatibility between energy independence and military capabilities: two key facets of national security
 - Most projects will be reviewed and cleared by Services in 30 – 45 days
 - Only projects with significant impacts or that need multi-Service coordination will receive full Clearinghouse attention



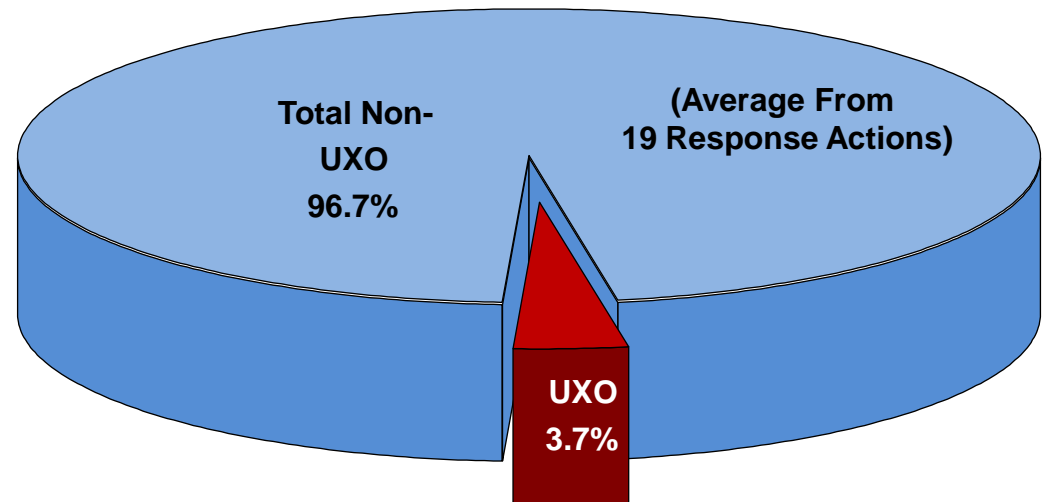
Dave Belote
Director, DoD Energy Siting Clearinghouse
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UXO Cleanup Dilemma

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- Less than 4% of excavations are UXO
 - Usually <1%
 - Ex. Camp Butner
 - 7 items out of > 100,000 digs
- Most items are harmless scrap
- Excavation of suspected UXO drives cost and time





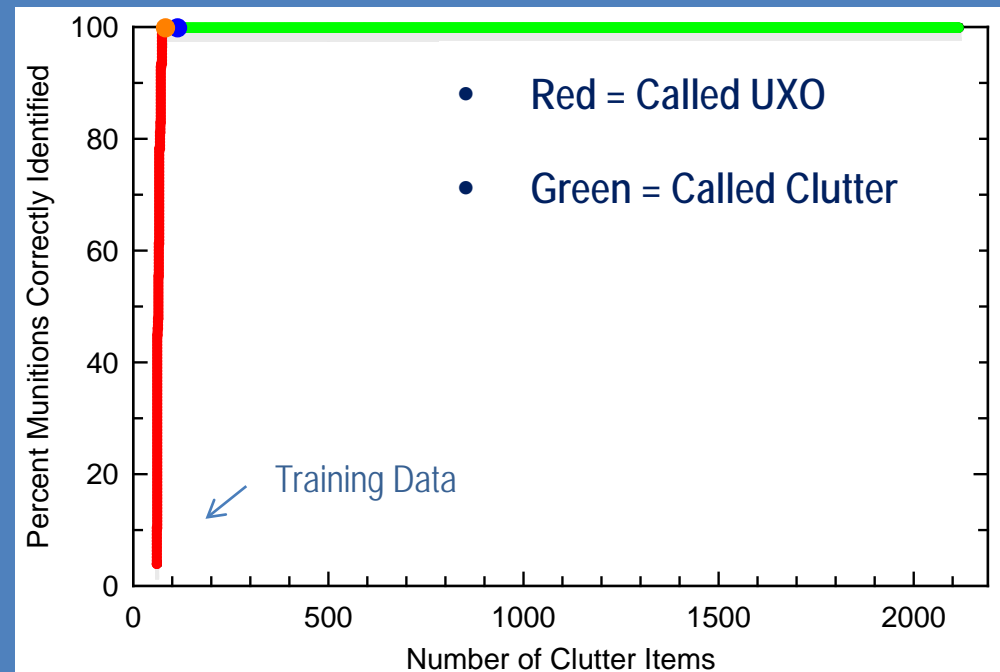
New Technology Enables Discrimination

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- SERDP/ ESTCP have been investing in this area for 10 years
- Result is technology that can distinguish UXO from clutter with high degree of reliability

Advanced Sensor at former Camp Butner, NC

- Near-Perfect Results are Achievable on a Real UXO Site
 - 100% of munitions correctly called UXO
 - Over 2000 correctly called clutter out of about 2100 total
 - Eliminate ~95% of clutter with no missed UXO





ESTCP Live Site Demonstration Program

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- Demonstrations on real munitions response sites completed at:
 - Camp Sibert, AL
 - Camp San Luis Obispo, CA
 - Camp Butner, NC
- Demonstrations are ongoing at:
 - Mare Island Naval Shipyard, CA
 - Pole Mountain, WY
 - Camp Beale, CA
- Five additional demonstrations are planned





Transforming the Practice

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